

1. (currently amended) A scanning probe microscope for imaging the surface of a sample, comprising:

a sensor comprising an oscillator for producing a signal;

a probe connected to the sensor;

an optical microscope disposed with the probe positioned between the optical microscope and the surface of the sample with the probe within a field of view of the optical microscope for viewing a the location of the probe mounted to the sensor for helping to position the probe with respect to a region of the surface of the sample to be imaged;

means for scanning the probe with respect to the sample;

sensor electronics connected to the sensor for monitoring the signal produced by the sensor; and

means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample.

2. (currently amended) The scanning probe microscope according to claim 1 wherein the oscillator is a resonant crystal oscillator.-

3. (currently amended) The scanning probe microscope system according to claim 2 wherein the resonant crystal oscillator is a quartz crystal cross oscillator comprising a crystal base and an arm to which the probe is connected.

4. (original) The scanning probe microscope according to

claim 2 wherein the resonant crystal oscillator is self-excited.

5. (original) The scanning probe microscope according to claim 3 wherein the quartz crystal cross oscillator is self-excited.

6. (original) The scanning probe microscope according to claim 2 wherein an external modulator is provided proximate to the resonant crystal oscillator, and further comprising an excitation circuit for supplying an excitation signal to drive the modulator.

7. (original) The scanning probe microscope according to claim 3 wherein an external modulator is provided proximate to the quartz crystal cross oscillator, and further comprising an excitation circuit for supplying an excitation signal to drive the modulator.

8. (original) The scanning probe microscope according to claim 1 wherein the scanning probe microscope is operable in a mode selected from the modes of magnetic force microscopy and electrostatic force microscopy and the signal produced by the sensor is used to determine characteristics of the sample selected from among the characteristics of magnetic and electrostatic properties, respectively.

9. (original) The scanning probe microscope according to claim 1, further comprising a holder for the sensor that facilitates rapid probe exchange.

10. (original) The scanning probe microscope according to claim 1 wherein the oscillator is operated at substantially its resonance frequency.

11. (original) The scanning probe microscope according to claim 10 wherein the resonance frequency is greater than 400 kHz.

12. (original) The scanning probe microscope according to claim 1 wherein the oscillator operates in a in a shear force mode by vibrating the probe approximately parallel to the surface of a sample.

13. (original) The scanning probe microscope according to claim 1, further comprising a cantilever and wherein the probe is mounted to the cantilever and the cantilever is in turn mounted to the sensor to connect the probe to the sensor.

14. (currently amended) The scanning probe ~~force~~ microscope according to claim 1 wherein the means for scanning the probe with respect to the sample comprises a first electromechanical transducer and a second electromechanical transducer, the first electromechanical transducer having a first resonant frequency and the second electromechanical transducer having a second resonant frequency substantially lower than the first resonant frequency, and wherein the means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprises a third

electromechanical transducer having a third resonant frequency substantially higher than the first resonant frequency.

15. (currently amended) The scanning probe ~~foree~~ microscope according to claim 14 wherein the first electromechanical transducer scans in an X direction and has a resonant frequency $R(X)$, the second electromechanical transducer scans in a Y direction and has a resonant frequency $R(Y)$, and the third electromechanical transducer scans in a Z direction and has a resonant frequency $R(Z)$, and $R(Z) \gg R(X) \gg R(Y)$.

16. (currently amended) The scanning probe ~~foree~~ microscope according to claim 15 wherein the electromechanical transducers are piezoelectric ceramic actuators.

17. (currently amended) The scanning probe ~~foree~~ microscope according to claim 15 wherein the first electromechanical transducer is a voice coil and the second and third electromechanical transducers are piezoelectric ceramic actuators.

18. (original) The scanning probe microscope according to claim 1 wherein the means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprises a first feedback loop for producing a first control signal, a first electromechanical transducer having a first resonant frequency, a second feedback loop for producing a second control signal, and a second

electromechanical transducer having a second resonant frequency, the first resonant frequency being lower than the second resonant frequency.

19. (original) The scanning probe microscope according to claim 18 wherein the first electromechanical transducer is employed to level the surface of the sample with respect to the sensor, whereby a range of motion imparted by the second electromechanical transducer to the probe is small.

20. (currently amended) The scanning probe microscope according to claim 14 wherein the motions imparted by the first and second electromechanical transducers to the probe are orthogonal to the motion imparted to the probe by the third electromechanical transducer, whereby a range of motion imparted by the third electromechanical transducer to the probe is less than a range of motion imparted to the probe by the first and second electromechanical transducers ~~small~~.

21. (original) A scanning probe microscope for imaging the surface of a sample, comprising:

a sensor comprising an oscillator for producing a signal;

a probe connected to the sensor;

means for scanning the probe with respect to the sample comprising a first electromechanical transducer and a second electromechanical transducer, the first electromechanical transducer having a first resonant frequency and the second

electromechanical transducer having a second resonant frequency substantially lower than the first resonant frequency;

sensor electronics connected to the sensor for monitoring the signal produced by the sensor; and

means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprising a third electromechanical transducer having a third resonant frequency substantially higher than the first resonant frequency.

22. (currently amended) The scanning probe ~~force~~ microscope according to claim 21 wherein the first electromechanical transducer scans in an X direction and has a resonant frequency $R(X)$, the second electromechanical transducer scans in a Y direction and has a resonant frequency $R(Y)$, and the third electromechanical transducer scans in a Z direction and has a resonant frequency $R(Z)$, and $R(Z) \gg R(X) \gg R(Y)$.

23. (currently amended) The scanning probe ~~force~~ microscope according to claim 21 wherein the electromechanical transducers are piezoelectric ceramic actuators.

24. (currently amended) The scanning probe ~~force~~ microscope according to claim 21 wherein the first electromechanical transducer is a voice coil and the second and third electromechanical transducers are piezoelectric ceramic actuators.

25. (currently amended) The scanning probe microscope according to claim 21 wherein the motions imparted by the first and second electromechanical transducers to the probe are orthogonal to the motion imparted to the probe by the third electromechanical transducer, whereby a range of motion imparted by the third electromechanical transducer to the probe is less than a range of motion imparted to the probe by the first and second electromechanical transducers ~~small~~.

26. (original) The scanning probe microscope according to claim 21, further comprising an optical microscope for viewing the location of the probe mounted to the sensor.

27. (canceled).

28. (canceled).

29. (canceled).